



KEMA

Residential Refrigerator Recycling Ninth Year Retention Study

Study ID Nos. 546B, 563

Prepared for

Southern California Edison Company
Rosemead, California

Prepared by

KEMA Inc.
Madison, Wisconsin

July 22, 2004

KEMA



FINAL
NINTH-YEAR PERSISTENCE
STUDY OF SOUTHERN
CALIFORNIA EDISON'S
1994 THROUGH 1997
APPLIANCE RECYCLING
PROGRAMS

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EXECUTIVE SUMMARY

This report provides the results of a ninth-year persistence study of Southern California Edison's (SCE) 1994 through 1997 Appliance Recycling Programs, as required by the Measurement and Evaluation Protocols (M&E Protocols) of the California DSM Measurement Advisory Committee (CADMAC).¹

As given in the M&E Protocols, the goal of this measure persistence study is to determine "the length of time the measure(s) installed during the program year are maintained in operating condition." This issue is addressed by estimating a measure's effective useful life (EUL). A measure's EUL is defined as its median survival time. For each of the program years 1994–1997, the EULs will reflect

- the time at which half the recycled appliances are from participating premises that have added an appliance and
- the time at which half the recycled appliances would have met their ultimate death anyway.

For each of the program years 1994 through 1997, both refrigerators and freezers have an *ex ante* estimate of the EUL of six years, which has been used in the earnings claims to date. A measure's *ex post* EUL is the EUL estimated by a persistence study. If a measure's *ex ante* EUL is outside the 80 percent confidence interval, the measure's *ex post* EUL may be used for future earnings claims. Otherwise, the measure's *ex ante* EUL will continue to be used in earnings claims.

For each of the program years 1994 through 1997, this study recommends SCE adopt an *ex post* EUL of eight years for both refrigerators and freezers.

E.1 SUMMARY OF RESULTS

The results of this study are summarized in Table E-1.

¹ California Public Utilities Commission, *Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-side Management Programs*, Decision 93-05-063. Revised June 1999, pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, 96-12-079, 98-03-063, and 99-06-052.

Table E-1
1994–1997 Appliance Recycling Program
Summary of Effective Useful Life Estimates

Program Year	Measure	End Use	EUL (years)					EUL Realization Rate (adopted <i>ex post</i> / <i>ex ante</i>)
			<i>ex ante</i>	<i>ex post</i> (estimated from study)	Adopted <i>ex post</i> (to be used in claim)	80% Confidence Interval		
						Lower Bound	Upper Bound	
1994	Freezer	Refrigeration	6.0	8.0	8.0	8.0	11.0	1.33
	Refrigerator		6.0	8.0	8.0	8.0	11.0	1.33
1995	Freezer	Refrigeration	6.0	8.0	8.0	8.0	11.0	1.33
	Refrigerator		6.0	8.0	8.0	8.0	11.0	1.33
1996	Freezer	Refrigeration	6.0	8.0	8.0	8.0	8.0	1.33
	Refrigerator		6.0	8.0	8.0	8.0	8.0	1.33
1997	Freezer	Refrigeration	6.0	8.0	8.0	8.0	8.0	1.33
	Refrigerator		6.0	8.0	8.0	8.0	8.0	1.33

For program years 1994 through 1997, Table E-1 presents the *ex ante* EULs, the selected results of the persistence analysis, the adopted *ex post* EULs, and the EUL realization rates by appliance type. For both refrigerators and freezers in each of these program years, the adopted *ex post* EUL equals the *ex post* EUL estimated from this study and the EUL realization rate is greater than one. In each case, the *ex ante* EUL is outside the 80 percent confidence interval and the *ex post* EUL estimated from this study seems reasonable.

E.2 ANALYSIS OVERVIEW

This study estimates the length of time the savings estimated by the first-year impact evaluation will last or persist. In particular, per the M& E Protocols, this study estimates the EUL or median survival time of these savings; that is, the time at which half these savings are no longer being realized. The first-year impact evaluations of the 1994–1997 Appliance Recycling Programs identified two sources of net savings:

- savings resulting from removing appliances from participating premises that otherwise would have kept the appliance (direct savings); and
- savings resulting from preventing the transfer of older, inefficient appliances to premises within the SCE territory (indirect savings).

In light of these two sources of net savings, we considered three definitions of survival. A recycled appliance fails:

1. when a participating premises adds an appliance;
2. when it would have met its ultimate death anyway; or

3. when a participating premise adds an appliance or when the recycled appliance would have met its ultimate death anyway, whichever comes first.

Direct savings may be considered to fail for any of these reasons, although we focused on the latter two. Indirect savings were considered to fail when the recycled appliance would have met its ultimate death anyway.

For each program year 1994 through 1997, the estimate of the EUL was obtained from a single survival curve for direct and indirect savings combined. For each of these program years, the steps we took to estimate a single survival curve for direct and indirect savings were as follows.

1. Estimate the survival curve where failure is defined as when a participating premise adds an appliance.
2. Estimate the survival curve where failure is defined as when a recycled appliance would have met its ultimate death anyway.
3. Combine these two survival curves, which produces the survival curve where failure is defined as when a participating premise adds an appliance or when a recycled appliance would have met its ultimate death anyway, whichever comes first.
4. Combine the survival curve for direct savings with the survival curve for indirect savings.

E.2.1 Data Sources

The data used in this study were obtained from a variety of sources:

- Program tracking data for program years 1994 through 1997,
- First-year impact evaluation conducted for the 1994 and 1996 programs,
- 2003 California Statewide Residential Appliance Saturation Survey,
- Survey of recent appliance discarders, and
- Survey of participating premises conducted for the fourth-year persistence study and this current persistence study.